UNITED
NATIONS

E

Economic and Social Council

Distr.
GENERAL

E/CONF.84/PC/4
28 August 1992

ORIGINAL: ENGLISH

POPULATION COMMISSION ACTING AS
THE PREPARATORY COMMITTEE FOR
THE INTERNATIONAL CONFERENCE
ON POPULATION AND DEVELOPMENT
Second session
16-19 August 1993
Item 3 of the provisional agenda

PREPARATIONS FOR THE INTERNATIONAL CONFERENCE ON POPULATION AND DEVELOPMENT

Recommendations of the Expert Group Meeting on Population, Environment and Development

Report of the Secretary-General of the Conference

SUMMARY

In response to Economic and Social Council resolution 1991/93, the Expert Group on Population, Environment and Development was convened at New York from 20 to 24 January 1992 as part of the preparations for the International Conference on Population and Development to be held in 1994. The findings of the Expert Group are presented in this report for consideration in the context of the review and appraisal of the World Population Plan of Action by the Population Commission acting as the Preparatory Committee for the Conference. The Expert Group appraised current trends in population and environment, focusing on their implications for sustainable development. The discussions concentrated on those areas where population growth and distribution have adverse impacts on the availability and use of key natural resources, such as freshwater, soils and forests, and on interactions of demographic factors, consumption and production patterns and global issues of increasing international concern, such as climate change and loss of biological diversity. The deliberations had as an essential perspective the goals of the World Population Plan of Action and specific policy measures that would promote the achievement of those goals. The recommendations deal with integration of technological, economic, environmental and population policy-making and planning; research, education and awareness creation; and international cooperation.

92-41440 4139a (E) 201092 *221092*

/...

CONTENTS

	Paragraphs	Page
INTRODUCTION	1 - 5	3
A. Background	1 - 3	3
B. Opening statements	4 - 5	4
I. SUMMARY OF THE PAPERS AND DISCUSSION	6 - 68	4
A. The population dimension	6 - 16	4
B. Interaction of population and resources	17 - 35	6
C. Environmental degradation	36 - 68	10
II. RECOMMENDATIONS		16
A. Preamble		16
B. Recommendations		17

INTRODUCTION

A. Background

1. The Economic and Social Council, in its resolution 1991/93 of 26 July 1991, decided to convene an International Conference on Population and Development under the auspices of the United Nations to be devoted to the discussion of the overall theme of population, sustained economic growth and sustainable development with the aim of contributing to the review and appraisal of the World Population Plan of Action 1/ and to its further implementation. The Council authorized the Secretary-General of the Conference to convene six expert group meetings as part of the preparatory work.

2. Pursuant to that resolution the Secretary-General of the Conference convened the Expert Group Meeting on Population, Environment and Development from 20 to 24 January 1992. The Meeting was organized at the United Nations Headquarters, New York, by the Population Division of the Department of Economic and Social Development of the United Nations Secretariat in consultation with the United Nations Population Fund (UNFPA). The participants, representing different geographical regions, scientific disciplines and institutions, included 16 experts invited by the Secretary-General in their personal capacities, representatives of the five regional commissions, the United Nations Industrial Development Organization (UNIDO), the Office of the United Nations High Commissioner for Refugees (UNHCR), the United Nations Conference on Environment and Development (UNCED), the Food and Agriculture Organization of the United Nations (FAO), the International Labour Organisation (ILO), the United Nations Centre for Human Settlements (UNCHS), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Health Organization (WHO) and the World Food Programme; representatives of the following governmental organizations: Ministry of State for Population and Environment, Indonesia; Ministry of Planning, Morocco; and Swedish Council for Planning and Coordination of Research; and representatives of the following non-governmental organizations: National Research Council of the National Academy of Sciences, the Population Council, the Royal Swedish Academy of Sciences, the National Audubon Society, the International Planned Parenthood Federation (IPPF) and the International Union for the Scientific Study of Population (IUSSP). There were two observers.

3. As a basis for discussion, the 15 experts had prepared papers on the main agenda items in order to provide a framework for discussion. The Department of Economic and Social Development had prepared a background document for the meeting, entitled "Population, development and the environment: an overview". Discussion notes were provided by the Department of Economic and Social Development, the Economic Commission for Europe (ECE), the Economic Commission for Latin America and the Caribbean (ECLAC), the Economic Commission for Africa (ECA), the Economic and Social Commission for Asia and the Pacific (ESCAP), FAO, ILO, UNCHS, WHO, IPPF, the National Research Council and the Population Council.

B. Opening statements

4. The Meeting was opened by Dr. Nafis Sadik, Secretary-General of the International Conference on Population and Development. She stressed the importance of population issues in achieving sustainable development and said that it was particularly appropriate for critical linkages between population, environment and development to be examined in light of disturbing demographic trends. Mr. Shunichi Inoue, Deputy Secretary-General of the Conference, reviewed the approaches to an environment/population nexus over the previous two decades and called for special attention to its policy implications.

5. The central task of the Expert Group was to examine demographic, socio-economic and environmental trends, their critical linkages, and relevant high-priority issues, in particular the triad of rapid population growth, increasing environmental degradation and pervasive poverty, and, on that basis, to make recommendations for action by Governments and intergovernmental and non-governmental agencies which would enhance compliance with the World Population Plan of Action and increase its effectiveness. The views expressed by the experts at the meeting were made in their personal capacities and did not represent the views of the Governments of their countries.

I. SUMMARY OF THE PAPERS AND DISCUSSION

A. The population dimension

6. The discussions of the Expert Group were profoundly influenced by an awareness that the world population was growing on average by 1.7 per cent per annum. By the turn of the century, the current world population of 5.4 billion people would be 6.25 billion. The Expert Group noted that the momentum of population growth ensured that at least another 3 billion would be added to the global total between 1985 and 2025. Over 90 per cent of that growth was taking place in the developing world, those countries least able to cope with the resource and environmental consequences of growing populations. Over the course of the 1990s, the population of the developing world would swell by over 900 million, while the population of the industrialized countries would grow by a mere 56 million.

7. In the early 1980s, it had seemed that the rate of population growth was slowing everywhere except in Africa and parts of South Asia. The world population seemed set to stabilize at around 10 billion towards the end of the next century. In 1992, the situation looked less promising, with stabilization likely to occur at a level 1.5 billion higher and about half a century later.

8. Although international migration involved only a small fraction of the world's population, it was large in absolute numbers, especially since migrants were unevenly distributed among countries. For some nations, international migration was a source of major demographic change and an important economic factor. The 1980s had witnessed the resurgence of

international migration as a worldwide phenomenon, with widening gaps between countries in demographic growth and economic progress.

9. In that context the Expert Group considered two development issues. First, the deepening poverty of individuals and nations. Globally, more than 1 billion people were living in absolute poverty, and the total international debt of developing countries was now $1.2 trillion and growing, although declining as a share of gross domestic product (GDP). Secondly, the social sector - including health, family planning, housing and education - continued to be underemphasized in national and international development programmes. At the national level, developing countries had struggled to keep pace with the needs of their populations, which had often doubled in the past 30 years. Yet, demands for health care, education, food security, housing and jobs were still increasing, and would continue to increase through the next decade and beyond.

10. The Expert Group noted that the world was in the middle of an urban revolution, fuelled in part by massive population shifts from rural to urban areas. Since 1950, the number of people living in cities had more than tripled, and in 1990 reached 2.4 billion. Although the urban population in the developed world had nearly doubled, in the developing world it had swelled five times, from 286 million to 1,515 million. In 1950, 29 per cent of the world population had been urbanized. By the year 2000, over half of humanity would live in urban areas.

11. Although urban populations levelled off in the developed world - growing by only 0.8 per cent a year, if at all - they were increasing in the developing countries. The United Nations projections indicated that in the year 2000, 77 per cent of Latin America's population, 41 per cent of Africa's and 35 per cent of Asia's would be urbanized.

12. The Expert Group noted that certain cities were reaching gigantic proportions. The rise of the mega-cities fostered the concentration of labour and industrial production in a few "primate" cities. An estimated 44 per cent of Mexico's gross domestic product, 52 per cent of its industrial output, and 54 per cent of its services were concentrated in Mexico City. Similarly, more than 60 per cent of all manufacturing output in the Philippines originated in Manila.

13. Given the rapid and largely unplanned urbanization, the Expert Group was particularly concerned that in the developing world, the ability of municipalities to keep ahead of the demand for infrastructure and services had been outpaced. In many cities of developing countries, housing, roads, health care, educational facilities and the provision of safe drinking water and sanitation had not kept up with the rising tide of urban dwellers.

14. The Expert Group paid attention to the large pool of unemployed, underemployed, unskilled and semi-skilled labour which was one consequence of the swelling urban population. Many of those marginal people ended up in slums and squatter settlements, unemployed, uneducated, undernourished and

chronically sick. In some cities, such as Lagos, Delhi, Dar-es-Salaam, Cairo, Bombay and Addis Ababa, more than 50 per cent of the people lived in substandard housing in slums, shanty-towns and squatter settlements. Tens of thousands more ended their days on the streets where they found shelter in make-shift shacks fashioned from discarded wood, canvas and cardboard.

15. Furthermore, studies had shown that many of those poor people became permanently marginalized, caught up in a vicious cycle of poverty. Surveys of squatter settlements revealed that many of the residents had lived in them for a decade or more. There was no upward or outward mobility. They began poor and ended poor, living their lives on the margins of survival. It should be recognized that the same situation often prevailed in rural areas where most of the world's poor were concentrated.

16. Another result of rapid urbanization was the alarming loss of prime agricultural land. The urban area of Delhi, for example, had grown nearly 13-fold since 1900, eating into surrounding cropland and absorbing more than 100 villages. According to FAO estimates, about 1.4 billion hectares of arable land would have been taken out of agricultural production because of urban sprawl between 1980 and the turn of the century.

B. Interaction of population and resources

17. Although population growth was but one of many factors that undermined the environmental resource base upon which sustainable development ultimately depended, it was an exceptionally significant factor. Indeed, in many countries there was a pronounced imbalance between the growth of population, on the one hand, and the natural resource base needed to support it, on the other.

1. Impact of population growth on the environment

18. The Expert Group noted that although there was wide acceptance of the view that various links exist between economic, environmental and population phenomena, the nature and strength of the reciprocal impacts were subject to a heated debate. Whereas some studies asserted that population growth was not an obstacle to economic growth, others supported the conclusion that population growth had a strong negative impact on the environment. Part of the controversy could be resolved by introducing a feedback from environment to economic performance. As population growth added to the number of consumers who put additional claims to natural resources and produced pollution, it damaged the environment; conversely, deterioration of the environment damaged the economy. Unfortunately, in the formulation of policy, environmental impacts were not properly accounted for in economic measurements.

19. That approach was consistent with the notion of sustainable development, as defined by the World Commission on Environment and Development:

"development that meets the needs of the present without compromising the ability of future generations to meet their own needs". 2/ Moreover, it was compatible with attempts to put into operation the concept of sustainable development. If income was defined as the maximum amount that a person or community could consume over some time period and still be as well off at the end of the period as at the beginning, sustainability became either weak or strong, depending on whether man-made capital was assumed to be perfectly substitutable for natural capital or complementary to it; in the latter case, which encompassed the predominant views of biologists, the goal was to maintain man-made and natural capital intact separately.

20. The Expert Group was aware that there were several linkages at work between population and the environment. The interaction of population, consumption (or production) patterns and technology in producing environmental impacts or pollution was often encapsulated in the equation:

$$I = PAT$$

where I is environmental impact, P is population, A is per capita consumption, and T is a measure of environmental damage done by technology employed in supplying each unit of consumption. In fact, the equation may be interpreted as conveying the notion that consumption and production patterns were proximate factors of environmental deterioration, channelling the underlying impacts of ultimate causes, which were the number of consumers (or producers) and their effective demand for goods and services.

21. The equation illustrates why developing countries with large populations but limited economic advancement could have a vast impact on the environment. Likewise, it makes clear that developed countries had an impact on population since the A and T multipliers for each person were exceptionally large.

22. During the discussion some objections were raised to the I = PAT equation, suggesting that the real relationships between population and the environment were more complex than the postulated linear interactions. For instance, the equation did not take into account the possible detrimental impact of population growth on per capita consumption. Furthermore, institutions were a key variable in determining whether societies would be successful in equilibrating population levels with the availability of resources and economic growth while ensuring sound environmental management. Reciprocity of obligations in the case of populations-induced environmental degradation was contingent upon cultural nuances of social expectations. Similarly, whereas technologies differed in their capacity for environmental damage and repair, social attitudes and systems helped to determine the costs of environmental preservation or degradation and hence the type of technology employed.

23. A technology-driven explanation was offered to show how population, coupled to the level of a given society's technological development, interacted to produce economic development and/or environmental degradation. By that analysis, development and degradation were linked in relative

fashion. The level of development was determined to a large extent by the level of technology, which in turn affected lifestyles and consumption patterns and determined environmental impact. In that case, population was seen as a peripheral factor, not a central part of the equation and technology became the more important multiplier. That analysis had been applied largely to the developed world, where most countries had already gone through the demographic transition to low rates of population growth.

24. Another way to look at the interrelationships between population and natural resources was discussed. According to that approach, the main variables - number of people, growth rates, dependence on natural resources, consumption levels and technological capacities - had an impact on the resilience of natural resources, which in turn determined the remaining quantity and quality of natural resource stocks. In global terms, the rate of natural resource consumption depended of course on the first five variables. The resilience of nature - or lack thereof - would determine what the final results are of human impact on natural resources.

25. The Expert Group noted that there was, however, an intermediate complication, because the physical availability of natural resources did not necessarily guarantee that those resources were entirely, or even partially accessible, or that they were equally accessible to all population groups. Some hydrologists, for example, had repeatedly drawn attention to the difference between water availability and accessibility. That distinction was fundamental for the understanding of people's interactions with nature. It obliged us to look beyond natural resources as purely biological and geo-physical factors and to analyse technological, managerial, economic and sociological factors.

2. Carrying capacity

26. The Expert Group paid particular attention to the concept of carrying capacity, or more appropriately, population-supporting capacity. The carrying capacity could be defined as the number of people that the planet could support without irreversibly reducing its capacity to support people in the future. While that was a global-level definition, it applied at the national level too, albeit with many qualifications as concerned international terms of trade, investment etc. In its wide sense it was a highly complex concept, reflecting food and energy supplies, ecosystem services, human capital, people's lifestyles, cultural constraints, social institutions, political structures, and above all, public policies among many other factors, all of which interacted with each other.

27. It was noted that two points were particularly important - first, that carrying capacity was ultimately determined by the component that yielded the lowest carrying capacity; and secondly, that human communities must learn to live off the "interest" of environmental resources rather than off their "principal".

28. The Expert Group was concerned about the evidence that human numbers with their consumption of resources and the technologies deployed to supply that consumption, were often already exceeding carrying-capacity. In many parts of the world, the three principal and essential stocks of renewable resources - forests, grasslands and fisheries - were being utilized faster than their rate of natural replenishment.

29. Preliminary research had shed some new light on the degree to which a given country was dependent on natural resources for development. Three variables had been shown to be important indicators:

(a) The importance of agricultural production to gross domestic product;

(b) GNP per capita (using the World Bank classification of low-, lower middle-, upper middle- and high-income countries);

(c) The level of population growth, assuming that high levels put pressures on key resources.

30. Data analysis showed that in each case there was a strong connection between low per capita incomes, high population growth rates and a dependence on agricultural production. Although still preliminary, the analysis tended to indicate that where those three factors combined, countries were heavily dependent on natural resource stocks to promote economic development. It also indicated that the solutions must be integrated, tackling a number of problems simultaneously.

3. Environmental discontinuities and uncertainties

31. The Expert Group concentrated on the issues of discontinuities and uncertainties in current ecological trends. It was possible for the resource base to collapse abruptly. That could precipitate a downturn in the capacity of environmental resources to sustain human communities at current levels of well-being. Furthermore, it would amount to a macrolevel change. Designated by ecologists as a "jump effect" of environmental discontinuity, or a threshold effect of irreversible injury, such a change occurred when ecosystems absorbed stresses over long periods without much outward sign of damage. Eventually the ecosystem reached a disruption level at which the cumulative consequences of stress finally revealed themselves in critical proportions. The effects of acid rain on fresh-water ecosystems and the widespread dieback of conifers seen across Europe and eastern North America were examples of environmental discontinuities.

32. Of special concern to the Expert Group was the problem of agricultural land shortages which was becoming widespread in many developing countries, especially in those where land provided the livelihood for more than 50 per cent of the population. During the 1970s, arable areas were expanding at roughly 0.5 per cent a year. But during the 1980s the rate dropped to only half as much. Primarily because of rapid population growth and unequal

distribution, the amount of per capita arable land declined by 1.9 per cent per annum.

33. In Costa Rica, where the agricultural frontier closed in the 1980s, for the first time in 400 years, people had no ready access to new land. With an annual population growth rate at 2.5 per cent, their predominantly agrarian society was having to adjust to a sudden change from land abundance to land scarcity.

34. Another issue of concern was the fuelwood crisis. Most people in the developing world depended on fuelwood and charcoal for their daily energy needs. As long as the number of wood collectors did not exceed the capacity of the tree stock to replenish itself through regrowth, the local community could exploit the resource indefinitely. But when the number of collectors grew until they exceeded the self-renewing capacity of the trees, perhaps exceeding it by only a small amount, quite suddenly a point was reached where the tree stock started to decline. Indeed, fuelwood shortages currently affected around 1 billion poor people in the developing countries.

35. Many environmental changes currently under way had not been experienced in the past, and a number of their components could not be fully anticipated until they actually occurred, at which time it might be too late to counteract them. Hence, there was a challenging task to choose an appropriate long-term strategy when standard short-term solutions such as market forces might not be able to provide sufficient insurance against the risks that were associated with crossing ecological thresholds (such as climate change or depletion of the stratospheric ozone layer). Moreover, critical uncertainties concerned the regional timing and magnitude of environmental change, and thus further complicated the assignment of strategic priorities.

C. Environmental degradation

36. Of particular concern were four population factors which had a significant impact on resource depletion and environmental quality. Those factors persisted for long periods, although their effects varied from country to country. The first was population size and rate of growth. The second was the population's age structure. The third factor related to the growing incidence of poverty. And the fourth factor was the concentration of populations in critical ecological zones, such as tropical forests and coastal zones.

1. Loss of agricultural land

37. It was noted that every year around 70,000 square kilometres of farmland were abandoned because the soils were too worn out and degraded for crop production; another 200,000 square kilometres suffered from reduced productivity.

38. Furthermore, soil erosion, the chief form of land degradation, claimed 24 billion tons of topsoil a year. Between 1985 and 2010, soil erosion alone could precipitate a 19-29 per cent decline in food production from rainfed croplands.

39. The problem, as many participants pointed out, was due to several factors apart from population growth - most notably, poverty. Impoverished people could not afford the conservation measures needed to protect soil cover. But population growth and concentration served to induce farmers to overuse and even exhaust the soil. Thus it often happened that agricultural yields were expanded to meet population growth's demand in the short term, at a cost to soil cover and fertility that eventually led to a decline in cropland productivity.

40. Overall, land degradation of various sorts was estimated to be causing an annual loss of 12 million tons of grain output. That translated into almost half of all the gains in grain output each year. Not only had the 1980s seen little expansion of cropland, but there appeared to be less scope than formerly for intensification of food production by bringing more land under irrigation.

41. Of special concern to the Expert Group was the fact that the current problems of land degradation would be compounded by the impact of population growth, which would add 1 billion people to the planet every 11 years: 900 million over the decade of the 1990s. Thus the coming decade could see a combination of mounting grain deficits, surging grain prices, and spreading hunger among ever larger numbers of people.

2. The destruction of tropical forests

42. The Expert Group recalled the FAO and the World Bank estimations on forest destruction. In 1980, FAO estimated tropical forest loss at around 11 million hectares a year, an area the size of Austria. However, more recent estimates by FAO, based on satellite imagery, suggested a much higher rate of around 17 million hectares a year. Recent World Bank estimates put the figure at between 17 million and 20 million hectares a year. Such estimates suggest a current rate of deforestation in developing countries of about 1-1.5 per cent per year. The greatest volume of forest lost was in Latin America, which - at 8.4 million hectares - accounted for about half of the world's total. However, the fastest rate of forest depletion was found in Asia.

43. There appeared to be three main causes of tropical forest loss: encroachment by landless slash-and-burn cultivators; large-scale logging operations; and conversion to grazing land and large plantations. By far, the major overall proximate cause of tropical forest destruction was the expansion of agriculture onto new lands, or agricultural "extensification". Of that, small-scale forest farmers were thought to be responsible for well over half of all deforestation, largely because logging operations and cattle ranches

had made it possible for those farmers to penetrate tropical forests which otherwise would be virtually inaccessible to them. The major underlying driving forces of cropland expansion into tropical forests were rural poverty and population growth.

44. The general pattern of forest degradation and rising population was observed in 15 Asian countries. Countries with an annual population growth rate of 2 per cent or more had experienced deforestation rates of more than 2 per cent per annum over the course of the 1980s (with the exception of Sri Lanka). Although those trends did not establish a causal link, they indicated broad patterns of demographic stress across countries with different population growth rates.

45. A more direct measure could be made at the country level, relating the increase in migrant populations and rates of forest conversion to agriculture. Two case-studies were presented, for the Philippines and Indonesia. In the Philippines, conversion of forests to croplands began much earlier (through government resettlement), while in Indonesia, cropland expansion into forest areas began on a large-scale in the mid-1970s.

46. Migrant populations in forested areas in both countries increased rapidly during the period 1980-1985, the period of worldwide economic crisis. In the Philippines, the rate of cropland expansion into forests was over 7.5 per cent a year, while the migrant population grew by nearly 4 per cent a year.

47. The causes of migration into forested areas were remarkably similar for most countries in Asia. In the first place, there were increasing numbers of people living on an increasingly circumscribed agricultural land base. In addition, competition for arable land worsened because of inequitable land distribution. Most existing croplands were already in the most fertile areas, so that the costs of expanding cultivation had increased.

48. It was noted that the rural labour force continued to expand in most developing countries, despite declining population growth rates. Because employment opportunities were often limited in urban centres as well as on long-settled croplands, important migration flows were being directed towards ecologically fragile frontier zones.

49. Furthermore, it was observed that population density continued to increase in more accessible areas, such as those close to roads and along coastlines. As population densities rose, there was greater pressure to intensify cultivation, increase harvests of forest products, and expand settlements to remote and steeper locations. Forest resources were then depleted faster than they were replaced, reducing their productivity and undermining growth.

50. There were serious off-site consequences when forests were permanently converted to farms. As shown in the watershed sites studied in the Philippines, intensive upland cultivation led to severe flooding and siltation of downstream areas.

51. It was also noted that population movements were induced by inappropriate government policies. Many settlement schemes opened up forests to migrants. Poor enforcement of post-logging conditions encouraged migration into logged-over sites. In addition, many government development programmes discriminated against the agricultural sector and reduced its growth and labour-absorbing potential. Although the impact of those policies varied by country, the role of population growth and other demographic factors remained constant in that they exacerbated the "push" conditions of movements into critical environments.

3. Freshwater resources

52. The Expert Group noted basically three sets of problems related to freshwater. First, water was becoming increasingly scarce. Although water was a finite resource, population was growing rapidly in many water-short countries. Secondly, water pollution was a growing problem in both developed and developing countries. Degraded water quality affected human health and welfare directly, while indirectly contributing to slower rates of development. Thirdly, water-related land degradation threatened the sustainable use of resources, especially in the South. That was a particular problem in areas dependent on irrigated agriculture, where salinization, waterlogging and alkalization were slashing yields and turning once-productive cropland into wasteland. Furthermore, salts released from irrigated soils were now polluting surface waters.

53. Furthermore, the Expert Group observed basically four types of water scarcity: the first two types were due to hydro-climatic factors; the other two, to human activities. In the first type of scarcity water evaporated rapidly before it could recharge aquifers or rivers. That was characteristic of deserts and arid areas and produced a short growing season. The second type was due to large inter-annual fluctuations in areas with limited rainfall to begin with. That resulted in recurrent droughts, with attendant loss of soil productivity. The third type of water scarcity was due to the desiccation of the landscape, a result of large-scale deforestation, destruction of watershed and overgrazing of grasslands. Such activities stripped away vegetation cover, exposing soils to torrential rains. Not only did massive soil erosion occur, but water ran off before it could recharge rivers and aquifers or be captured for other uses (e.g., irrigated agriculture). The fourth type of water scarcity was due principally to two factors: increasing demand because of rapidly growing populations, and/or gross inefficiencies of use.

54. Of special concern to the Expert Group was the fact that water scarcity was one of the ultimate threats to sustainable development and livelihood security. In the short-to-medium term, the combination of land degradation and intermittent droughts increased the risk for crop failures and famine. In the long term, rapid population growth aggravated the problem of water scarcity since there was less water per capita to support human life, improve health and food security, and increase market-oriented activities such as cash crop and industrial production.

55. It was noted that water scarcity already affected 88 developing countries, with 40 per cent of the world population. By the end of the decade, all five countries in North Africa and six out of seven in East Africa would experience severe water shortages. All but one, Ethiopia, had population growth rates of 2.5-3.8 per cent per annum.

56. It was agreed that there was a critical need for Governments to devise integrated strategies for managing both water and land resources. Without a broader view of water, one that was not bound by traditional hydrological engineering concepts of the North, the water crisis was likely to become severe in many areas of the world, presenting a real threat to further industrial development and expansion of agriculture.

4. Loss of biological diversity

57. As tropical forests continued to disappear, so too did a wealth of fauna and flora, genetic resources of inestimable value to human welfare. Science had identified only around 1.7 million species of plants and animals, but 10 million or even 30 million might exist. Clearing the forest could consign several million or more unknown species to oblivion by the turn of the century.

58. Although tropical forests contained most of the world's wild species, seven "mega-diversity countries" had a disproportionately large share of the world's genetic heritage. Brazil, Colombia, Mexico, Zaire, Madagascar, Indonesia and Australia, together, contained over 54 per cent of the earth's known species. From the point of view of conservation, it seemed perfectly sensible to select those countries for priority action.

59. But there was another reason why those countries deserved priority attention - in all but one, population growth exceeded by far the average growth rate of the world population for the period 1950-1980. Furthermore, human populations were expected to continue expanding rapidly during the two decades from 1980 to 2000.

60. Although there was no one-to-one relationship in the population/environment equation, it must be expected that, while the proportion of the world's population in the mega-diversity countries increased, the proportion of the world's species found there might decrease. The number of people added in those countries in recent decades plus expected future population increases would, if trends continued, inevitably lead to the clearance of more forests, degradation of water resources and marginalization of over-cultivated land, thereby extinguishing a certain number of species.

61. Even if the natural resources of the mega-diversity countries could eventually accommodate with ease their growing populations, the speed of population growth would make it difficult for them to expand the sustainable use of natural resources sufficiently and rapidly enough to cater to people's needs.

5. Climate change

62. The Expert Group was particularly concerned with the climate changes caused by emissions of greenhouse gases. Recent reports of the Intergovernmental Panel on Climate Change confirmed the build-up of greenhouse gases in the atmosphere, a build-up almost certain to result in global climate change. Worldwide emissions of carbon dioxide, the gas that caused half the greenhouse effect, had risen from 2.4 billion tons of carbon in 1950 to 6.8 billion in 1985, an average increase of 3.1 per cent per annum. (The figures were actually underestimations, since they took inadequate account of the carbon dioxide releases from the destruction of tropical forests.) During the same period, world population grew, on average, by 1.9 per cent per annum. The rest of the increase, 1.2 per cent per person per annum on average, was derived from higher per capita consumption of goods that involved the production of carbon, growth in energy demand, and changes in technology. According to that reckoning, population growth was responsible for almost two thirds of the increase in carbon dioxide emissions.

63. Despite the limitations to that analysis, it was helpful to the Expert Group when considering the future outlook. If carbon dioxide emissions in developing countries continued to grow at the rate of the past 40 years, they would more than double from the 1985 per capita level of 0.8 tons to 1.7 tons by 2025. By that time, too, their populations were projected to nearly double, from 3.7 billion in 1985 to 7.1 billion by 2025. The population increase would produce an additional 5.78 billion tons of carbon dioxide, a total to be compared with the present worldwide total of 6.9 billion tons.

64. The Expert Group noted that the problem of future population growth and rising carbon dioxide emissions could be exemplified by India. With a current per capita income of only $330 per annum, India's electricity capacity was 55,000 MW, about twice that of New York State. Although the country possessed meagre coal reserves, it was exploiting them so fast that it currently ranked as the world's fourth largest coal burner. In 1950, its coal use was only 33 million tons, but by 1989 it had soared to 191 million tons. Furthermore, the Government had plans to supply electricity to half the houses in the country. That goal alone would require the production of an additional 80,000 MW of power. It was anticipated that that measure, together with other development plans, would double India's carbon dioxide emissions.

65. However, such analyses said nothing about the energy savings that could be achieved through better efficiencies of scale and by switching from polluting fossil fuels to renewable sources of energy such as solar, wind, geothermal, hydro etc. Clearly, the industrialized countries needed to cut down on carbon dioxide emissions by burning fuel more efficiently and by developing alternatives.

66. The Group considered an alternative analysis of the links between population and climate change which produced a different set of conclusions. According to that analysis, there were two principal mechanisms by which population growth in developing countries contributed to the potential for

global warming. The first was through population growth and higher per capita energy consumption levels because of increased demand for energy for power, industry and transport. The second mechanism was the effect of population growth and expanding production on deforestation, with its associated emissions of carbon dioxide. Cutting down trees also reduced the major land-based sink for carbon dioxide.

67. Over the past 30 years, the total contribution of the developing world to carbon dioxide emissions due to the burning of fossil fuels was about 20 per cent. The implications of those data were clear. Although the developing world currently contributed relatively little to emissions, especially given their larger share of the global population, it was likely that they would become a major source of a substantial part of future growth in fossil fuel demand, for the same reasons that caused their share in total emissions to rise in the past several decades. Their per capita carbon dioxide emissions were still low but were likely to rise with increasing income. Their emissions per dollar of GNP were relatively high; and they had and would continue to have higher rates of population growth.

68. According to that analysis, given that the bulk of carbon dioxide emissions originated in the North, population factors had a relatively small impact on emissions. The main reason for increasing amounts of greenhouse gases was the world's continued dependence on fossil fuels for energy. As the South increased its industrial base, fossil fuel use would inevitably increase and with it, carbon emissions.

II. RECOMMENDATIONS

A. Preamble

69. The problems associated with and flowing from patterns of development, environmental degradation and population growth and distribution were in many parts of the world reaching critical proportions. The need to address those problems was, therefore, urgent.

70. Environmental systems were capable of accommodating the human use of natural resources only to a certain extent. When those limits were reached, discontinuities in environmental processes arose, often with acutely adverse consequences. Furthermore, population growth often outpaced the ability of societies to generate and adopt adequate technological and institutional changes. Detrimental impacts on the environment would, in many contexts, be best reduced by a combined strategy of slowing population growth, rationalizing population distribution, alleviating poverty, lessening environmentally dangerous consumption patterns and introducing appropriate technologies and management regimes. Sound development policies would integrate the strategies adopted to achieve all those goals.

71. Although demographic, economic and ecological processes were inextricably interrelated, the magnitude of the reciprocal impacts in different

socio-cultural and ecological settings was not sufficiently documented. Thus, to promote sustainable development, there was urgent need to strengthen data collection and research efforts in that domain and to test the efficacy of proposed policies and strategies in concrete settings.

72. The Expert Group, having reviewed the available methodological approaches, empirical research and its policy and operational implications, proposed the following recommendations. The implementation of those recommendations would require considerable additional financial and technical resources, particularly for the developing world. The international community was urged to contribute and mobilize the urgently required additional resources on a sustained basis.

B. Recommendations

Recommendation 1

Because there are strong linkages between population, development and the environment, Governments are urged to establish or strengthen mechanisms to coordinate policies and programmes and give unified direction for integrating environmental and population concerns into development policy-making and planning. In particular, Governments are urged, when formulating their social and economic policies, plans and programmes in any sector, to take fully into account the implications of projected demographic trends and of patterns of production and consumption, for the protection of the environment and the conservation of natural resources. Governments should incorporate these population concerns into national conservation strategies.

Recommendation 2

Governments should support the development of technologies and the use of currently available technologies designed to achieve sustained economic growth and sustainable development while maintaining a balance between population and resources, with particular attention to replacing fossil fuels with renewable energy sources, and should create incentives for promoting their application. Developed countries should make these technologies available to developing countries at reasonable cost.

Recommendation 3

To avoid further environmental degradation and, where possible, to improve environmental conditions, Governments are urged to identify areas subject to acute population pressures, such as arid lands, tropical forests, watersheds, coasts and coastal waters, and to institute policies, such as integrated population and development policies, that will alleviate the pressure on the environment.

Recommendation 4

Governments should encourage the implementation of ecologically beneficial labour-intensive projects such as reforestation, contour-levelling, terracing and small-scale irrigation and drainage for their environmental benefits and to assist in job creation.

Recommendation 5

Community-based population and environment programmes should emphasize the participation of women as environmental managers, including the employment of women in government conservation programmes such as reforestation, social forestry schemes, parks and protected areas. Therefore, Governments should improve women's educational levels, health status, employment opportunities, environmental sensitivity and participation in national and local decision-making.

Recommendation 6

Given the increasing scarcity of water, especially under conditions of rapid population growth and urbanization, Governments should develop the best uses of the water available, maximize the productivity of biomass and other products per unit of water, find options for water-saving industrial production of goods, improve scientific and planning capacity, and develop an integrated approach to land and water management.

Recommendation 7

Because poverty is closely related to continued high fertility and rural and urban environmental degradation, Governments are encouraged to enhance the access of the rural and urban poor to employment opportunities, credit, and social services such as education, health and family planning. To achieve these ends, Governments should promote community participation in improving the delivery of these services.

Recommendation 8

Since many of the changes required involve radical alterations in human behaviour in order to improve and conserve local environments and promote the small, healthy family, great emphasis should be put on popular education and participation - especially those of women.

Recommendation 9

National Governments should provide additional resources to local authorities for the management of cities, particularly those that are experiencing rapid population growth; and adequate training should be provided in municipal management, including the provision of environmental services.

Recommendation 10

Governments, international organizations and non-governmental organizations are urged to find durable solutions to problems related to environmentally displaced persons, including the provision of support and assistance to receiving regions and countries and to work towards the elimination of the root causes of these problems.

Recommendation 11

Since increasing population pressure is leading to the establishment of new human settlements and an extension of the exploitation of natural resources into areas highly vulnerable to natural disasters, Governments and international agencies are urged to minimize the ensuing hazards to the environment and human health and safety by such means as urban land-use planning and the promotion of emergency prevention and preparedness.

Recommendation 12

International governmental and non-governmental organizations are urged to intensify and increase their efforts in promoting an understanding of the severe impacts on health of environmental degradation and in transferring appropriate technologies for monitoring and minimizing such impacts to countries in need of them.

Recommendation 13

International organizations should increase their assistance to countries in the fields of population, sustainable development and environment, especially in training, research, policy formulation and the integration of population and environment-related factors in national planning.

Recommendation 14

International organizations, Governments and non-governmental organizations should increase their efforts to create greater awareness of the interrelated issues of population, environment and development. This should be done through the formal education system, existing demographic training institutions and collaborative training and educational programmes of non-governmental organizations.

Recommendation 15

In order to address the relationships between population, environment, economic growth and sustainable development issues, databases should be strengthened and developed so as to promote an understanding of these issues and to make them available and accessible to policy makers and programme managers.

Recommendation 16

Policy-oriented research should be undertaken to identify critically endangered areas beset by population pressures, destruction of the ecosystem and degradation of resources and to determine how these factors interact.

Recommendation 17

In devising strategies for sustainable development, special attention should be given to improving the plight of indigenous populations. Their accumulated knowledge and methods for sustainable exploitation should be taken into account.

Recommendation 18

In order to implement these recommendations, Governments and international organizations should identify and openly analyse the conflicting goals between countries, regions and groups so as to make fruitful negotiation possible and to create solutions with mutual gains.

Notes

1/ See Report of the United Nations World Population Conference, 1974, Bucharest, 19-30 August 1974 (United Nations publication, Sales No. E.75.XIII.3), chap. I.

2/ World Commission on Environment and Development, Our Common Future (Oxford, Oxford University Press, 1987), p. 8.